

ACCELERATED SITE TECHNOLOGY DEPLOYMENT

Fact Sheet

Deploying Improved Measurement and Monitoring Systems

Fernald Environmental Management Project (FEMP)
In Partnership with the Office of Science and Technology

INTRODUCTION: The Fernald Environmental Management Project (FEMP) is a 1,050-acre DOE Closure Site currently undergoing decommissioning and environmental restoration. As environmental cleanup work at the FEMP accelerates towards closure and long-term stewardship, there is an increasing need for new, innovative technologies to perform real-time physiological monitoring, land surveying, and wireless radon monitoring.

In the process of deactivating and decommissioning DOE facilities, individual laborers sometimes need to work in/near radiological and hazardous locations, and in situations that lead to extreme physical conditions. At FEMP, these types of extreme conditions will likely occur in the upcoming FEMP Silos project and in other restoration projects across the site. Technologies are needed that reduce workers' risk during engineering, construction, and environmental restoration operations. To minimize these risks, three newer technologies are being procured for deployment at FEMP. Collectively, these technologies will provide for the monitoring of worker vital signs, improved land surveying, and the remote transmission of radon monitoring data.

To assist FEMP in its cleanup, EM's Office of Science and Technology (OST) has partnered with the site in an Accelerated Site Technology Deployment (ASTD) project with OST providing \$327,000 for the deployment of three improved technologies. Through this activity, beneficial technologies will be deployed to enhance worker safety and health, and to improve monitoring capabilities for existing hazards. Overall decommissioning and remediation life-cycle costs are expected to be significantly lowered via the deployment of these technologies.

TECHNICAL NEED: The innovative technologies being deployed address multiple site needs by performing real-time physiological monitoring, collecting land survey measurements, and monitoring for radon (wireless system). Technologies being deployed include: Real-Time Physiological Monitoring System (RTPMS), Remote Prismless Total Station (RPTS), and state-of-the-art **radon monitoring** system.

RTPMS provides real-time data on the physiological conditions of workers as they carry out their job, typically wearing Personal Protective Equipment (PPE). The PPE required often includes multiple layers of semi-permeable/impermeable clothing and full-face respirators that can compromise a worker's natural ability to cool him/herself, plus making visual observation of workers' condition difficult for co-workers and supervisors.

RPTS enables a single surveyor to perform tasks that normally require a crew of 2 or 3 workers. Survey measurements are frequently required in radiological controlled and/or potentially hazardous work environments.

Continuous **radon monitoring** at the FEMP is performed for the following reasons:

- Ensure compliance with radon concentration limits established in DOE Order 5400.5, Radiation Protection of the Public and Environment;
- Satisfy mandated monitoring requirements under the Federal Facilities Agreement with regard to National Emission Standards for Hazardous Air Pollutants Subpart Q;
- Rapidly monitor radon emissions from radon-generating materials contained in on-site waste storage areas in order to gauge potential impacts to the public.
- Plus, there is a defined need to address the cost issues as radon and air monitoring are long term monitoring activities, which will last at least as long as major project remediation activities.

The existing monitoring program, which utilizes a network of radon monitors, is inadequate for providing immediate access to all radon monitoring data from various locations around FEMP. The new system will fulfill the site's need.

SYSTEM DESCRIPTIONS: The **RTPMS** provides real-time monitoring of vital signs for up to ten workers at the same time. It consists of a series of probes worn by the worker, a portable (transmitter) monitor, a monitoring (receiving) system that utilizes wireless signal transmissions, and a computer. The



Real Time Physiological Monitoring System with computer

RTPMS can monitor up to four channels of physiological indicators (e.g., heart rate, body activity, ear canal temperature, and skin temperature) for ten workers from a single supervisory station.



RPTS: The infusion of reflectorless laser distance measuring technology into surveying instruments is the latest advancement in total station technology.

"Reflectorless" or "prismless" measurements allow a lone instrument operator to make highly accurate survey measurements to remote, inaccessible, or hazardous locations. This surveying instrument has an onboard data collection computer. The robotic total station utilizes an internal servo tracking system that automatically follows the surveyor's position.



Workers stay clear of dangers and still obtain measurements with the RPTS.

The radon monitoring system

consists of: a single control device (i.e. computer), appropriate software, and data loggers, tied together by wireless communication devices. The computer would be located in a secure location with a dedicated network and use software components that control the data collection process and stores the received data. The control and data transmissions must be made over secure wireless media with maximum data transmission range and not interfere with or be susceptible to interference from existing power communications networks (radio, phone, high voltage lines etc.) at the FEMP site.



FEMP - Waste Pit and Silo Area

BENEFITS: Each technology benefits the decommissioning and remediation efforts currently underway at FEMP by providing safer and more rapid methods to perform the work.

The **RTPMS** has the capacity to accurately measure and collect the vital signs from several workers simultaneously; and the ability to provide real-time data for personnel monitoring. The system can transmit remotely collected data to a command station through obstructions such as structures and building materials where the information can be monitored or recorded.

This system's return on investment is in worker health and safety.

By deploying the **RPTS**, FEMP can realize significant cost savings by:

- Improving worker safety,
- Minimizing the cost of labor, and
- Reducing the consumption of PPE & related costs.

Features of the **RPTS** will increase the safety of site surveyors by eliminating the need for them to enter potentially hazardous areas while simultaneously increasing efficiency. **An estimated cost savings of \$370,500 is associated with the use of the RPTS at FEMP.**

By deploying a **wireless radon monitoring system**, FEMP can realize significant cost savings in telephone service costs for data transmission, telephone service installation costs, and reduced manpower and vehicle costs for operations surveillance including daily surveillance of air monitors. Based upon a life-cycle cost estimate for seven years of environmental monitoring activities, use of the technology to electronically transmit environmental data via a wireless communication system will yield an estimated **cost savings of ~\$775,000.**

STATUS –November 2000: The technologies described herein were selected for ASTD program funding in Spring 2000 and funds were provided to FEMP in May 2000. These funds (\$327K) are being used to champion the initial cost of the equipment & systems as well as the costs to integrate the technologies into FEMP's operations.

A vendor for the RTPMS demonstrated a unit at FEMP in early November 2000. In terms of the path forward, a demonstration unit is scheduled to be onsite in December, a procurement let for a site-owned system in March 2001, the RTPMS delivered in April, and the unit deployed at FEMP during May 2001.

The RPTS purchase order was issued in September 2000. In late October, the RPTS was shipped to FEMP and its receipt is expected in mid- to late November. Training [of work crews] is scheduled for December 2000, with deployment of the system to immediately follow.

A RFP for the wireless radon monitoring system was issued in September 2000. Vendor responses were received in October and are currently being reviewed. Contract award is expected in December 2000, and complete system installation is scheduled for May 2001.

Technology communication products, e.g., fact sheets, will be developed throughout the life of this project and the success of each technology will be widely reported in a variety of formats.

For more information about these deployments at the Fernald Environmental Management Project Site, contact:

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